A HIGH-ORDER DISCONTINUOUS GALERKIN METHOD WITH PLANE WAVES AND LAGRANGE MULTIPLIERS FOR THE SOLUTION OF SHORT WAVE ACOUSTIC SCATTERING PROBLEMS

C. Farhat[a] and **P. Wiedemann-Goiran**[a]

[a]Department of Aerospace Engineering Science
and Center for Aerospace Structures
The University of Colorado
Boulder, Colorado 80309-0429
charbel@boulder.colorado.edu
Paul.Wiedemann-goiran@colorado.edu

Recently, a discontinuous Galerkin method (DGM) with plane wave basis functions and Lagrange multiplier degrees of freedom was proposed for the efficient solution of the Helmholtz equation in the mid-frequency regime [1]. This method was fully developed however only for low-order elements (small number of plane waves), regular meshes, and was demonstrated only for interior Helmholtz problems. In this paper, we extend it to higher-order elements, irregular meshes, and exterior Helmholtz problems in order to expand the range of applications of this DGM to practical acoustic scattering problems. We report preliminary results for short wave problems that highlight the superior performance of this DGM over the standard as well as other finite element methods, and its ability to capture several wavelenghts within a single element.

References

[1] C. Farhat, I. Harari, and U. Hetmaniuk, "A Discontinuous Galerkin Method with Lagrange Multipliers for the Solution of Helmholtz Problems in the Mid-Frequency Regime ," *Computer Methods in Applied Mechanics and Engineering,* v. 192, p. 1389-1419, 2003.